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Aliquando enim tardè & cum pessimorum Symptomatum Satellitio erupere variolæ; aliquando incassum cessit Incisio; illa tamen loca Inoculationis ulceribus cacoetheis repleta fuerunt. Nonnullis etiam lethalis fuit talis Operatio: Mumia enim fermentativa, e marcidis istis tuberculis, rancida ac veluti cadaverizata non solum expetito scopo haud satisfacit, sed pravam sanguini potest communicare putrilaginem.

VII. *An Abstract of a Letter from Petrus Van Muschenbroek, M. D. F. R. S. Professor of Mathematicks and Astronomy in the University of Utrecht, in Holland; to Dr. J. T. Desaguliers, F. R. S. concerning Experiments made on the Indian Magnetick-Sand.*

S I R,

I Don't know whether I dare take up your Time with my Trifles; yet I'll venture for once to acquaint you with some things concerning the *Indian-Sand*, which is attracted by the Loadstone.

The *Indian-Sand* which is brought to *Holland*, is said to be chiefly gather'd upon the Sea-shore in *Persia*; then it is boiled in Water, to free it from its Saltness, and it is after this a black Powder, consisting of Grains of different Bigness; some of which have a very rough Surface, and others have one part of their Surface something rough, and the other very shining: Their Figure is very irregular, like Grains of
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common *Sand*, only this *Indian-Sand* is smaller. These little Lumps have neither Taste nor Smell, and are friable, so as to be easily reduc'd to a very subtil Powder. It has some Parts, which are strongly attracted by the Loadstone; and others so very inactive, as scarcely to seem to be magnetical: the strongest are the blackest; but the inactive ones are more shining, and more inclining to the Colour of Lead; these are in the greatest Quantity, and from them the others are got out by a Loadstone. The Ingenious *Moutenus* has examin'd several ways such a kind of *Sand* which is brought from *Virginia*, and describ'd it in the *Philos. Trans.* N° 197. I have examin'd the *Indian-Sand* another way; of which, I have given an Account in my *Physical Dissertations*, pag. 127; but a great deal still remain'd to be consider'd, and as there is a great deal more of this Substance of the Lazy or Inactive, than of the Active or Magnetick sort, it was proper to try whether a Magnetick Virtue might not be excited or increased in all of it; and after a few Trials I found the Thing to succeed. I suspected that there might perhaps be too great a quantity of Sulphur adhering to the *Sand*, to suffer it to be turn'd into any Metalline Regulus by a long Continuance in the Fire; therefore, I toasted it in an open Crucible for two Hours with half the quantity of Pot-ash; afterwards I wash'd away the Salt with Water, and the *Sand* remain'd much blacker than before, of which I found more than a Quarter endued with a greater Magnetick Force. I do not scruple to attribute this Virtue to the Salt; because, tho' the Action of the Fire alone does encrease the Force of the *Sand*,
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yet it does not give it near so much attractive Force.

Because common black Soap is made of Oil boiled with a Lixivium of Pot-ash, I had a mind to try whether Soap might not do more than Salt alone in raising the Virtue in the *Sand*; so I mix'd the *Sand* with an equal quantity of Soap, which I first expos'd to a gentle Fire in an open Crucible, to dry up the Soap which swells very much; then the Fire was encreas'd for three quarters of an Hour, all the oily Substance wholly consum'd, and the Matter in the Crucible was strongly fir'd; then afterwards boiling it in Water, and washing it well, I obtain'd a black *Sand*, which was all endued with a lively attracting Force. Very well pleas'd with this Success, I had a Mind to try whether I might raise a greater Force in it; wherefore I again roasted it with black Soap as before, and even a third Time; but no Addition was thereby made to its Virtue: I find that staying too long in the Fire is as prejudicial as staying too short a Time, between half an Hour and an Hour seem'd to me the most proper space of Time.

After, I added to the black Soap half of Salt of *Tartar*, and mix'd thereto an equal quantity of *Sand*; which, when it had been expos'd to a reverberatory Fire $\frac{1}{2}$ of an Hour in a Crucible, I wash'd in Water; and then so great was the Virtue of the *Sand*, that if it did not exceed the former, at least it was equal to it.

Because I had observ'd the Oiliness of the Soap to conduce much to excite the Vertue in the *Sand*; I

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mix'd Beef-Tallow with an equal quantity of *Sand*, and having very well clos'd the Crucible, I expos'd the whole Mass to a reverberatory Fire for two Hours, whereby the *Sand* became much blacker, and receiv'd a great deal of attractive Virtue: but that *Sand* became much more active which was burn'd two Hours with an equal quantity of Pitch, as likewise very black, subtil, and very little shining: but when it was expos'd a longer Time in the same Crucible, I observ'd it to be weaker; as also, when it was in the Crucible with the Pitch but $\frac{1}{2}$ of an Hour, it scarce acquir'd any Virtue; so that there must be a determin'd Action of Fire to raise the Vertue in the *Sand*. Yet I cou'd not raise a greater Virtue in the *Sand* than by the means following, *viz.* mixing the *Sand* in the Crucible with equal parts of Rosin, Pitch, Frankinsence, and Rape Oil, and exposing it to a reverberatory Fire for an Hour, having first well clos'd up the Crucible. Between the black Coals of the oily Matter, there sticks a very black *Sand*, which leaps up swiftly to the Loadstone, as soon as it is brought near it. Then I consider'd whether the *Sand* did not acquire the greatest Force as it came nearer to the Nature of Steel, by burning it with the Bodies abovemention'd; and suspecting this, in order to try it, I put it among such Bodies as turn Iron into Steel, according to the Operations describ'd by that great Experimenter Monsi. *Reaumur*, in that excellent Book, entituled, *The Art of turning Iron into Steel*. I took therefore three parts of *Sand*, two parts of Chimney-Soot; and of Sea-Salt, Powder'd Charcoal, and Ashes, one Part each. Having accurately

curately mix'd all these Bodies together, they were expos'd for six Hours in a close Crucible to a strong Fire; and then the whole Mass was boil'd and wash'd in Water, then dried, and so received a great deal of attracting Force; but it was not near so active as that which was prepar'd with Soap, or in the manner last describ'd.

And now, what can this *Sand* be? Is it an imperfect Magnet, or subtile Powder of it, which when it is grown up into a greater Lump, makes the vulgar Loadstones? So I conjectur'd at first; but when I found by Experience that common Loadstones expos'd to the Fire, according to some of the Methods above-mention'd, did rather lose of their Force than gain, I alter'd my Opinion; and now confess that I have not yet penetrated into the Knowledge of the Nature of this Matter.

Whatever it be, it is certain that there are several kinds of this *Sand*, brought from different Countries of the Earth: For it is brought from *Persia*; some is brought from *Virginia*; there is another sort in *Italy*, which is common enough at *Leghorn*, and this last is naturally very attractive; there are two sorts found in the *Eber*, a River of *Hassia*; of which, one is like the *Italian*, and the other consists of large Grains, almost as big as Hemp-Seed, but scarce having any Virtue. I have besides a very strong Sort, which I am told was got near old *Ragusa* in *Dalmatia*. NoBody knows how many kinds of this *Sand* there are: that Time, and the diligent Observations of Philosophers must hereafter shew.

I herewith send you a little Box, containing one Paper with the natural *Sand*; another, the *Sand* after

having burn'd it with Soap in the manner describ'd. It is no Treasure; but if you have none of it, it may be worth your Acceptance.

I am, Sir,

Utrecht, Jan.
15th, 1733. O.S.

Your, &c. &c.
Petrus Van Muschenbroek!

VIII. *An Account of some Observations made in London, by Mr. George Graham, F. R. S. and at Black-River in Jamaica, by Colin Campbell, Esq; F. R. S. concerning the Going of a Clock; in order to determine the Difference between the Lengths of Isochronal Pendulums in those Places. Communicated by J. Bradley, M. A. Astr. Prof. Savill. Oxon. F. R. S.*

ALtho' it is now above Sixty Years since Mr. *Richer* first discovered, that Pendulums of the same Length, do not perform their Vibrations in equal Times in different Latitudes; and tho' several Experiments made since in different parts of the Earth concur to prove, that Pendulums swinging Seconds are in general shorter as we approach the Equator; yet what the real Difference is between their Lengths in different Latitudes, does not seem to have been determined with sufficient Exactness,
by